

REMARKS/ARGUMENTS

The Final Office Action dated January 14, 2011 (“Office Action”), has been received and carefully considered. In this response, claim 1 has been amended and claim 22 has been added. No new matter has been added. Entry of the amendments to claim 1 and addition of claim 22 is respectfully requested. Reconsideration of the outstanding rejections in the present application is also respectfully requested based on the following remarks.¹

I. THE EXAMINER DISCUSSION

At the outset, the undersigned thanks the Examiner for the courtesies extended to consider the proposed claim amendments and the discussion of the proposed amendments on April 7, 2011.

II. THE INDEFINITENESS REJECTION OF CLAIMS 1-9 AND 21

On page 2 of the Office Action, claims 1-9 and 21 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the invention.

Regarding claim 1, the Office Action asserts that the limitation “conditioning and pre-melting” is indefinite for failing to particularly point out and distinctly claim the invention. Applicant respectfully disagrees. However, in order to forward the prosecution of the present application, Applicants have amended claim 1 to further clarify the present patent application. Applicants submit that the Specification defines the processed semiconductor wafer as a wafer

¹ As Applicant’s remarks with respect to the Examiner’s rejections are sufficient to overcome these rejections, Applicant’s silence as to assertions made by the Examiner in the Office Action or certain requirements that may be applicable to such rejections (e.g., assertions regarding dependent claims, whether a reference constitutes prior art, whether references are legally combinable for obviousness purposes) is not a concession by Applicant that such assertions are accurate or such requirements have been met, and Applicant reserves the right to analyze and dispute such in the future.

having electrically active structures thereon. *See, e.g.*, Published Application, paragraph [0016], lines 6-7.

The fact that glass paste “comprises glass particles and organic vehicle” (binder) is again just a definition of glass paste as is apparent from the citation “FERRO” (already submitted in an IDS to the USPTO) which mentions an organic vehicle on page 1, left column, second paragraph and binder-burnout on the right-hand column of page 1, 5th paragraph. The same definition is also given in the US 6,183,871 B1, abstract, the Lee reference (e.g., hereinafter ‘871 Patent), where it is stated that sealing glass paste comprises at least one sealing glass frit powder and a binder which may comprise an emulsion of a polymeric material, among others. The difference between powder glass and glass paste is also clearly shown in the publication of “Central Glass” (submitted in the current IDS).

The opinion of the examiner that there are multiple possibilities to which “conditioning” may refer to, as indicated on page 2 of the Office Action is respectfully traversed. In particular, Applicants respectfully submit that the alleged possibilities (1) is not possible because the glass paste is formed into a specific shape in a specific location during the step of applying the glass paste to the respective surfaces; (2) is also not possible because mixing glass frit with a solvent to form the glass paste, has to be done, according to claim 1, **prior to applying** the glass paste to the respective surfaces; (3) is further not possible because stirring of the glass paste, if necessary, would have to be done prior to providing the glass paste as claimed in amended claim 1. In other words, a finished glass paste is provided, the finished glass paste is applied to the respective surfaces and only thereafter, the conditioning and pre-melting takes place.

Further, the sequence of the steps in amended claim 1 can also be taken from the “FERRO” reference because the page 2 of this reference, clearly shows the sequence that:

- (1) *The constituencies of the glass paste are mixed completely,*
- (2) *a layer of the glass paste is printed on a substrate,*
- (3) *the base film is dried (conditioned) at approximately 110°C for a period of time, and*
- (4) *the binder resin is burned out (pre-melted) at approximately 350°C*
- (5) *a sealing cycle is carried out which completes the sealing operation.*

Thus, in view of the above, a man skilled in the art would clearly understand that conditioning and pre-melting is carried out between applying the glass paste to a substrate and completing the seal by baking the glass paste to form the seal. The conditioning and pre-melting is carried out in order to remove the binder, and this removal of the binder can only happen in between applying the glass paste to the substrate and finally baking the glass paste to form the seal. Therefore, a man skilled in the art would not have any other interpretation at hand but that the “conditioning and pre-melting” is synonymous to drying and pre-baking which is done prior to finally baking the glass material to form the seal out of glass.

In addition, the Examiner admits that glass frit and glass paste are synonymous and define a material which consists out of glass particles and a binder. This is also supported by the teaching of Ristic, Warren, and ‘871 Patent. Also, the term “glass solder” is again synonymous with “frit glass or glass paste” as can be learned from the webpage of SCHOTT North America - Solder Glasses (copy enclosed) under the heading “Solder glasses,” discloses that “solder glasses, also referred to as frit glasses are special glasses with a particularly low softening point (below 550°C). They are used to join glass to other glasses, ceramics, or metals without thermally damaging the materials to be joined.” Thus, in view of the foregoing, the opinion of the Examiner stated on page 15, line 1 to 4 of the Office Action is respectfully traversed. There is no contradiction between the various terms used and, in a case of glass paste it is clear that such glass paste contains “glass particles and organic solvent.” In particular, the term “glass”

used in Published Application, paragraph [0016], line 3 is only used in connection with “electrically conductive solder 5 **on the basis of** glass” and is, therefore, correct. The use of the term “glass” in Published Application, paragraph [0016], line 2, is just another name for the glass material used for the layers 6, 6a, 6b and is, therefore, also correct. The use of the term glass solder is, therefore, also correct.

Accordingly, Applicant respectfully requests that the aforementioned indefiniteness rejection of claims 1-9 and 21 be withdrawn.

III. THE OBVIOUSNESS REJECTION OF CLAIMS 1-8 AND 21

On page 5 of the Office Action, claims 1-8 and 21 were rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over U.S. Patent No. 5,094,969 to Warren (“Warren”) in view of U.S. Patent No. 5,545,912 to Ristic *et al.* (“Ristic”) and further in view of U.S. Patent No. 6,817,917 to Kado *et al.* (“Kado”). This rejection is hereby respectfully traversed.

Under 35 U.S.C. § 103, the Patent Office bears the burden of establishing a prima facie case of obviousness. In re Fine, 837 F.2d 1071, 1074 (Fed. Cir. 1988). There are four separate factual inquiries to consider in making an obviousness determination: (1) the scope and content of the prior art; (2) the level of ordinary skill in the field of the invention; (3) the differences between the claimed invention and the prior art; and (4) the existence of any objective evidence, or “secondary considerations,” of non-obviousness. Graham v. John Deere Co., 383 U.S. 1, 17-18 (1966); see also KSR Int’l Co. v. Teleflex Inc., 127 S. Ct. 1727 (2007). An “expansive and flexible approach” should be applied when determining obviousness based on a combination of prior art references. KSR, 127 S. Ct. at 1739. However, a claimed invention combining multiple known elements is not rendered obvious simply because each element was known independently in the prior art. Id. at 1741. Rather, there must still be some “reason that would have prompted”

a person of ordinary skill in the art to combine the elements in the specific way that he or she did. Id.; In re Icon Health & Fitness, Inc., 496 F.3d 1374, 1380 (Fed. Cir. 2007). Also, modification of a prior art reference may be obvious only if there exists a reason that would have prompted a person of ordinary skill to make the change. KSR, 127 S. Ct. at 1740-41.

Regarding claim 1, the Office Action asserts that the claimed inventions would have been obvious in view of Warren, Ristic, and Kado. Applicant respectfully disagrees. Applicant submits that neither the cited portions of Warren, Ristic, and Kado, nor Warren, Ristic, and Kado generally, disclose, or even suggest, joining “at least two processed semiconductor wafers having electrically active structures thereon” in a middle position of a stack wafer and “joining the at least two processed semiconductor wafers at a first processing temperature of the electrically non-conducting glass paste and at a second processing temperature of the electrically conducting glass pastes using a mechanical pressure,” as currently recited in claim 1.

Furthermore, claims 1 and 22 claim the following sequence of steps of:

providing electrically non-conducting glass paste and electrically conducting glass paste;

applying patterned layers of electrically non-conducting glass paste and electrically conducting glass paste on said wafer sides;

thereafter conditioning and premelting the electrically non-conducting glass paste and electrically conducting glass pastes;

thereafter providing geometrical alignment of the at least two processed semiconductor wafers to be connected; and

thereafter joining the at least two processed semiconductor wafers at a first processing temperature of the electrically non-conducting glass paste and at a second processing temperature of the electrically conducting glass pastes using a mechanical pressure.

Applicants respectfully submit that Warren, Ristic, and Kado, either alone or in combination, fail to disclose, or even suggest, each and every limitation of claim 1. In particular, Warren teaches forming a **substrate** that is formed from a **core substrate** out of flexible, low-temperature, co-fireable ceramic tape and an **outer substrate** of ceramic tape. The core

substrate has apertures for **inserting** (complete) integrated circuit devices therein. The substrate is heated to form a rigid body which then mounts the integrated circuits (ICs). The rigid body and the ICs are covered or at least partly covered with an insulating glass and heated to a temperature that fuses the glass to hermetically seal the substrate in a single structure. *See, e.g.* Warren, abstract. Thus, Warren fails to disclose, or even suggest a process for connecting processed semiconductor wafers where the processed semiconductor wafers **have electrically active structures thereon** which are to be completed to electrical circuits upon bonding of the two processed semiconductor wafers upon having aligned the wafers and firing the glass paste layers. Furthermore, Warren fails to disclose or even suggest the claimed sequence of steps.

The Office acknowledges that the substrate of Warren is not a wafer and relies on Ristic to remedy the deficiencies of Warren. However, Ristic discloses that the wafers are, at first, mechanically processed and thereafter bonded in an electrically insulating way by means of layer 14. The cover 16 mentioned in Ristic has only the function of electrically shielding the circuitry on substrate 12. The cover 16 of Ristic cannot be understood as a processed wafer. Therefore, completion of an electric circuitry being designed partly on each of the two wafers which are combined according to an embodiment of the present disclosure, is not possible in Ristic. Thus, the combination of Warren and Ristic fails to disclose, or even suggest, the claimed invention.

Further, the Office Action asserts that Kado discloses pre-baking of glass paste at 350°C. However, pre-baking is only one of the sequence of steps taken according to claim 1 directed to prepare two wafers, cover them with electrically conductive and electrically nonconductive layers in particular patterns and joining the two wafers with their respective layers in a final processing step which not only joins the two wafers by bonding but also completes the electrical circuitry contained on the two processed wafers. Thus, Applicants respectfully submit that the

combination of Warren, Ristic, and Kado, either alone or in combination, fail to disclose, or even suggest, each and every claimed limitation recited in claim 1.

Regarding claims 2-8 and 21, these claims are dependent upon independent claim 1. If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. In re Fine, 837 F.2d 1071 (Fed. Cir. 1988). Thus, since independent claim 1 should be allowable as discussed above, claims 2-8 and 21 should also be allowable at least by virtue of their dependency on independent claim 1. Moreover, these claims recite additional features which are not disclosed, or even suggested, by the cited references taken either alone or in combination.

In view of the foregoing, Applicant respectfully requests that the aforementioned obviousness rejection of claims 1-8 and 21 be withdrawn.

IV. THE OBVIOUSNESS REJECTION OF CLAIM 9

On page 13 of the Office Action, claim 9 was rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Warren in view of Ristic and further in view of Kado and further in view of U.S. Patent Application Publication No. 2003/0170936 to Christensen (“Christensen”). This rejection is hereby respectfully traversed.

Applicant respectfully submits that the aforementioned obviousness rejection of claim 9 has become moot in view of the deficiencies of the primary references (i.e., Warren, Ristic, and Kado) as discussed above with respect to independent claim 1. That is, claim 9 is dependent upon independent claim 1 and thus inherently incorporates all of the limitations of independent claim 1. Also, the secondary reference (i.e., Christensen) fails to disclose, or even suggest, the deficiencies of the primary references as discussed above with respect to independent claim 1. Indeed, the Office Action does not even assert such. Thus, the combination of the secondary

reference with the primary references also fails to disclose, or even suggest, the deficiencies of the primary references as discussed above with respect to independent claim 1. Accordingly, claim 9 should be allowable over the combination of the secondary reference with the primary references at least by virtue of its dependency on independent claim 1. Moreover, claim 9 recites additional features which are not disclosed, or even suggested, by the cited references taken either alone or in combination.

V. NEWLY ADDED CLAIM 22

Regarding claim 22, while different in overall scope from claim 1, this claim recites subject matter related to claim 1. Thus, at least some of the arguments set forth above with respect to claim 1 are equally applicable to claim 22. In particular, the cited references, either alone or in combination, fail to disclose, or even suggest, joining “at least two processed semiconductor wafers having electrically active structures thereon” in a middle position, and “thereafter joining the at least two processed semiconductor wafers at a first processing temperature of the electrically non-conducting glass paste and at a second processing temperature of the electrically conducting glass pastes using a mechanical pressure.” Accordingly, Applicants respectfully submit that claim 22 should be allowable over the cited references.

VI. CONCLUSION

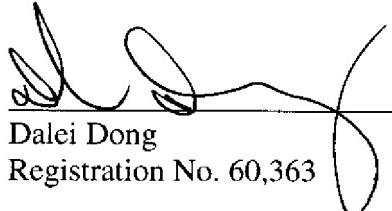
In view of the foregoing amendments and arguments, Applicant respectfully submits that this application is now in condition for allowance. If the Examiner believes that prosecution and allowance of the application will be expedited through an interview, whether personal or telephonic, the Examiner is invited to telephone the undersigned with any suggestions leading to the favorable disposition of the application.

It is believed that no fees are due for filing this Response. However, the Director is hereby authorized to treat any current or future reply, requiring a petition for an extension of time for its timely submission as incorporating a petition for extension of time for the appropriate length of time. Applicant also authorizes the Director to charge all required fees, fees under 37 C.F.R. §1.17, or all required extension of time fees, to the undersigned's Deposit Account No. 50-0206.

Respectfully submitted,

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